United States Environmental Protection Agency
Washington, DC 20460

Interagency Agreement/ Amendment

Part 1 - General Information

1. EPA IA Identification Number	2. Funding Location by Region
DW-19-92383101 - 0	EPA R5
3. Other Agency IA ID Number (if known)	**4. Awarding Office**
	IASSC East
5. Type of Action	**6. IA Specialist:**
New	Lenore Connell 202-564-5343 Connell.Lenore@epamail.epa.gov

7. Name and Address of EPA Organization	8. Name and Address of Other Agency
US Environmental Protection Agency IASSC East 1200 Pennsylvania Avenue, NW Mail code 3903R Washington, DC 20460	Department of State Great Lakes Fishery Commission 2100 Commonwealth Blvd Ann Arbor, MI 48105
9. DUNS: 029128894 **10. BETC:** DISB	**11. DUNS:** 074247255 **12. BETC:** COLL

13. Project Title and Description
Great Lakes Restoration Initiative (GLRI) - Great Lakes Fishery Commission

Continuing its Great Lakes Restoration Initiative (GLRI) partnership with EPA, the Great Lakes Fishery Commission will implement priority programs, projects, and activities to protect, restore and maintain the Great Lakes ecosystem in support of the GLRI Action Plan.

14. EPA Project Officer (Name, Address, Telephone Number)	15. Other Agency Project Officer (Name, Address, Telephone)
Tina Davis 77 West Jackson Blvd. (G-17J) Chicago, IL 60604-3507 312-353-8254 **E-Mail:** Davis.Tina@epa.gov **FAX:** 415-947-3530	Stephen Domeracki 2100 Commonwealth Blvd Ann Arbor, MI 48105 734-669-3017 **E-Mail:** sdomeracki@glfc.org **FAX:** 734-741-2010
16. Project Period: 06/30/2013 to 03/31/2014	**17. Budget Period:** 06/30/2013 to 03/31/2014

18. Scope of Work (See Attachment)
See attached Scope of Work;

19. Employer/Tax ID No.	20. CAGE No.	21. ALC
520852695	347A4	68-01-0727

22. Statutory Authority for Transfer of Funds and Interagency Agreement	23. Other Agency Type
Consolidated Appropriations Act; 2012; and Public Law 113-6	Federal Agency

24. Revise Reimbursable Funds and Direct Fund Cites (only complete if applicable)

	Previous Funding	This Action	Amended Total
Revise Reimbursable (in-house)		0	0
Direct Fund Cite (contractor)		0	0
Total			0

Funds	Previous Amount	Amount This Action	Total Amount
25. EPA Amount		$3,008,733	$3,008,733
26. EPA In-Kind Amount			$0
27. Other Agency Amount		$0	$0
28. Other Agency In-Kind Amount			$0
29. Total Project Cost		$3,008,733	$3,008,733

30. Fiscal Information

Treas. Symbol	DCN	FY	Appropriation	Budget Org	PRC	Object Class	Site/Project	Cost Org	Ob/De-Ob Amt
683/40108	1305HDX025	1314	B	05HT0	202BJ7XF2	2506			2,533,733
683/40108	1305HDX025	1314	B	05HT0	202BJ7XF4	2506			475,000
									3,008,733

Part II - Approved Budget

EPA IAG Identification Number: DW-19-92383101 - 0

31. Budget Categories	Itemization of All Previous Actions	Itemization of This Action	In-Kind Itemization of This Action	Itemization of Total Project Cost to Date
(a) Personnel		$35,001		
(b) Fringe Benefits		$8,751		
(c) Travel		$5,000		
(d) Equipment		$990,000		
(e) Supplies				
(f) Procurement / Assistance		$1,826,741		
(g) Construction				
(h) Other				
(i) Total Direct Charges	$0	$2,865,493	$0	
(j) Indirect Costs:	$0	$143,240		
Charged - Amount Rate: % Base: $ Not Charged: Funds-Out: Not charged by Other Agency Estimate by other Agency Amount $				
(k) Total (EPA Share %) (Other Agency Share %)	$0	$3,008,733	$0	

32. How was the IDC Base calculated?

33. Is equipment authorized to be furnished by EPA or leased, purchased, or rented with EPA funds? ☒ Yes ☐ No
(Identify all equipment costing $1,000 or more)

34. Are any of these funds being used on extramural agreements? ☒ Yes ☐ No

Type of Extramural Agreement: Grant

Contractor/Recipient Name (if known)	Total Extramural Amount Under This Project	Percent Funded by EPA (if know
TBD	1826741 Total $ 1,826,741.00	

Part III - Funding Methods and Billing Instructions

35.

(Note: EPA Agency Location Code (ALC) - 68010727)

☒ Disbursement Agreement — Request for repayment of actual costs must be itemized on SF 1080 and submitted to the Financial Management Cincinnati, OH 45268-7002:

☐ Repayment — ☐ Monthly ☐ Quarterly ☐ Upon Completion of Work

☒ Advance — Only available for use by Federal agencies on working capital fund or with appropriate justification of need for this payment method. Unexpended funds at completion of work will be returned to EPA. Quarterly cost reports will be forw the Financial Management Center, EPA, Cincinnati, OH 45268-7002.

☐ Allocation Transfer-Out — Used to transfer obligational authority or transfer of function between Federal agencies. Must receive prior approva Office of Comptroller, Budget Division, Budget Formulation and Control Branch, EPA Hdqtrs. Forward appropriate re the Financial Reports and Analysis Branch, Financial Management Division, PM-226F, EPA, Washington, DC 20460.

36. ☐ Reimbursement Agreement ☐ Repayment ☐ Advance
☐ Allocation Transfer-In

Other Agency's Billing Address (include ALC or Station Symbol Number)	Other Agency's Billing Instructions and Frequency

Part IV - Acceptance Conditions	EPA Identification Number DW-19-92383101 - 0
37. Terms and Conditions, when included, are located at the end of the 1610-1, or as an attachment.	

Part V - Offer and Acceptance

Note: A) For Fund-out actions, the agreement/amendment must be signed by the other agency official in duplicate and one original returned to the Grants and IA Management Division for Headquarters agreements or to the appropriate EPA Regional IA administration office within 3 calendar weeks after receipt or within any extension of time that may be granted by EPA. The agreement/amendment must be forwarded to the address cited in item 29 after acceptance signature.

Failure to return the properly executed document within the prescribed time may result in the withdrawal of offer by EPA. Any change to the agreement/amendment by the other agency after the document is signed by the EPA Award Official, which the Award Official determines to materially alter the agreement/amendment, shall void the agreement/amendment.

B) For Funds-In actions, the other agency will initiate the action and forward two original agreements/amendments to the appropriate EPA program office for signature. The agreements/amendments will then be forwarded to the appropriate EPA IA administration office for signature on behalf of the EPA. EPA will return one original copy after acceptance returned to the other agency after acceptance.

EPA IA Administration Office (for administrative assistance)	EPA Program Office (for technical assistance)
38. Organization/Address U.S. Environmental Protection Agency IASSC East 1200 Pennsylvania Avenue, NW Mail code 3903R Washington, DC 20460	39. Organization/Address US Environmental Protection Agency R5 - Region 5 77 West Jackson Blvd. Chicago, IL 60604-3507

Award Official on Behalf of the Environment Protection Agency

40. Digital signature applied by EPA Award Official | FOR Frank N. Roth - Chief Fellowship IA & SEE Branch Michelle Messick - AO delegate	Date 07/02/2013

Authorizing Official on Behalf of the Other Agency

41. Signature	Typed Name and Title ROBERT G. LAMBE (RL) ~~Chris Goddard~~, Executive Secretary	Date 7/8/13

EPA Form 1610-1 (Rev. 11-09) Previous editions are obsolete.

2013 Great Lakes Fishery Commission Interagency Agreement
Terms & Conditions

1. Participation in Great Lakes Water Quality Agreement (GLWQA) and Great Lakes Restoration Initiative (GLRI) Programs and Processes

The Great Lakes Fishery Commission (GLFC) shall participate in the Great Lakes Restoration Initiative (GLRI) and the Great Lakes Water Quality Agreement (GLWQA) programs, as requested. Such activities shall include, but not be limited to, meetings, conferences, and workshops directly tied to carrying out and implementing the GLRI and GLWQA.

2. Effort on Great Lakes Activities

U.S. EPA will work with the GLFC to ensure that the funds transferred under this IA are not used to supplant the base programs' funding of the GLFC. U.S. EPA recognizes its effort in this regard must be consistent with the GLFC's statutory authority.

3. Minimization of Indirect Costs

Conference Report language encourages U.S. EPA and its federal partners to limit overhead. Consequently, the GLFC will be required to minimize its indirect costs.

Indirect costs are intramural and extramural costs not directly attributable to the GLFC's effort. These costs may include management and administrative support costs, headquarters' allocation of facilities, personnel compensation support costs to regions and program offices, regional management and support costs and program office support costs.

4. Use of Contracts and Grants

A. The GLFC may use the funds transferred under this IA consistent with its grants, contracts and other programs in order to support the GLRI and the GLWQA.

To the extent that the GLFC uses funds transferred by U.S. EPA under authorities that have match requirements, the Agency shall minimize the required match to the extent allowed under its authorities and regulations, unless the U.S. EPA Project Officer agrees otherwise.

The GLFC will use a competitive process to select awardees of grants and contracts consistent with its authorities and regulations. To the extent feasible, any Requests for Proposals (RFPs) for contract awards and grant awards, as well as invitation for bids, shall be shared with the U.S. EPA Project Officer and made available to the members of the Regional Working Group in a timely manner in advance of publication, allowing at least fifteen days for review and comment. The GLFC will publish the name of those proposals which are selected and funded.

To the extent possible, contractors and awardees must commence work within 60 days of the effective date of an award.

B. <u>The GLFC will use the following principles for project selection as set forth in the templates and as reflected in the solicitations for the Agency's contracts and grants activities:</u>

•Target projects to maximize environmental protection and restoration for the Great Lakes;
•Ability to advance implementation of GLRI Action Plan priorities;
•Ability to strategically-achieve measurable environmental outcomes linked to the highest priority issues;
•Ability to advance environmental priorities of existing Great Lakes strategic plans, especially the Lake-wide Management Plans and Programs, Remedial Action Plans for Areas of Concern, the Great Lakes Regional Collaboration, the Binational Toxics Strategy and other relevant national and regional coordinated strategic planning efforts;

•Feasibility of prompt implementation, including a bias for action-ready projects and for those which demonstrate quick results;
•Observable local improvements, especially for projects at the field level;
•Bias for interagency/inter-organizational coordination and collaboration;
•Support for new work and for enhancements which do not replace existing Great Lakes base activities;
•Support by the Public and other Stakeholders;
•Ability to leverage non-federal resources;
•Promotion of long-term societal, economic, and environmental sustainability goals; and
•Minimization of transaction costs.

C. Projects and activities must also meet standards for:

- Using best available science;
- Experience, ability, and authority of the funding recipient to properly perform the work;
- Reasonableness of project costs; and
- Measuring progress and success.

The GLFC shall offer U.S. EPA and the Agencies represented on the Regional Working Group a timely opportunity to review RFP submissions and serve on RFP review and selection panels consistent with existing authorities and the GLFC's policies.

5. Expedite Required Permits:

The GLFC shall obtain all required permits in a timely fashion for projects implemented under this IA. To the extent resources are required to expedite permit processing, U.S. EPA may authorize the use of IA resources for this purpose.

6. Healthy, Safety and Environmental Compliance:

All health, lab and field activities conducted for this project must be in accordance and compliance with all applicable health, safety and environmental laws, regulations and guidelines.

7. Signage

If appropriate and feasible, the GLFC shall ensure that a visible project identification sign is erected as appropriate at each on-the-ground protection or restoration project. Each sign must give project information and credit the Great Lakes Restoration Initiative and appropriate federal agencies for funding. The Agency will determine the design, placement, and materials for each sign.

8. Modification of Interagency Agreement and Written Approval for Transfers Among Templates

This Interagency Agreement can be amended or modified in writing upon consent of the Parties. The Scope of Work attached to this Interagency Agreement can be amended in writing upon consent of the Parties.

The GLFC must receive prior written approval by the U.S. EPA Project Officer for cumulative transfers among templates or projects which exceed or are expected to exceed the lesser of $100,000 or ten percent of the Recipient's approved allocation.

9. Reporting

Quarterly Financial Progress Reports: The GLFC shall ensure that quarterly reporting is provided on funding utilized under GLRI and GLWQA activities. This reporting includes programs funded at or below $500,000 that may not otherwise be identified in cross-cut budgets. This quarterly reporting shall be completed in the Great Lakes Accountability System (GLAS).

Semi-Annual Progress Reports: The Commission shall submit progress reports, beginning with the date of IA execution, every six (6) months during the life of this agreement. Reports shall be submitted to the U.S. EPA Project Officer and may be provided electronically. The reports must contain information in order to ascertain that the Scope of Work (SOW) is being carried out as specified in the Interagency Agreement. The U.S. EPA Project Officer must be able to determine that all mission support products, services, information or data generation and use, including technology development and verification, is performed in accordance with U.S. EPA policies and the IA agreement.

Annual Report: Beginning in FY 2012, U.S. EPA will work with its Interagency Task Force partners to prepare and submit an Annual Report to the President on progress in achieving the Initiative's goals, outcomes, and targets. To that end, the Recipient shall include in an annual report to U.S. EPA, information on its Great Lakes activities, including those funded pursuant to the Great Lakes Restoration Initiative and those funded by its base programs. The report shall include funding beginning in FY 2011 and each fiscal year thereafter, detail yearly program accomplishments, and compare specific funding levels allocated for participating Federal agencies from fiscal year to fiscal year. Reporting shall include programs funded at or below $500,000 that may not otherwise be identified in cross-cut budgets.

Final Progress Report: The Commission shall submit a final report to the U.S. EPA Project Officer upon expiration of this IA. This report shall incorporate project outputs and summarize the nature and extent of the project, methodologies employed, significant events and experiences, and a compilation of the data collected. The final report shall also include analysis of the data as well as conclusions, and recommendations. The final report shall incorporate photo documentation of funded projects and environmental progress under the projects at appropriate phases, and appropriate illustrations, diagrams, charts, graphs, and maps to express the data and findings. Electronic and paper versions of the Final Report shall be submitted no later than 90 days after the end of the project period.

10. Accountability/Performance System

The GLFC and other Great Lakes partners will input all required accountability and performance report information into the Great Lakes Accountability System (GLAS). Information will describe GLRI activities and demonstrate how results are being achieved pursuant to the Action Plan. Recipients and sub-recipients shall be responsible for inputting their accounting/performance data into the GLRI database. The website for the database will be accessible through the GLNPO website at https://restore.glnpo.net/glas/login.htmhttp://www.epa.gov/glnpo.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 2005-0001. This information collection is scheduled to expire on July 31, 2013.

11. Quality Assurance

As appropriate, the GLFC must have a Quality Assurance (QA) and Quality Control (QC) System in place that will provide the needed management and technical practices to assure that environmental data used to support GLRI decisions are of adequate quality and usability for their intended purpose. This system must be in place before any data collection takes place. Since most of the GLRI decisions will rest on environmental data, a management system is needed that provides for:

1. Identification of environmental programs for which QA and QC activities are needed;
2. Specification of the quality of the data required from environmental programs; and,
3. Provision of sufficient resources to assure that an adequate level of QA and QC activities are performed.

This IA will provide mission support products, services, information or data generation including technology development and verification. Any of these activities will be performed in accordance with approved Quality Assurance procedures or standards with adequate documentation for transparency

purposes, including review and approval by recipients QA manager. Because of the nature of the action, data may be collected without U.S. EPA review and approval of a project-specific Quality Assurance documents.

The U.S. EPA Quality Assurance Officer must be notified when procedures are developed and the quality assurance procedures should be documented. Quality Assurance documentation should be maintained by the IA recipient, but must be provided for review by the U.S. EPA Quality Assurance Office on an as needed basis.

This documentation should include, but is not limited to,
(1) quality assurance procedures, including the rationale for decisions concerning sampling and analysis;
(2) decisions on usability of data; and
(3) information on quality-control methods and measurements, e.g., performance evaluation samples, field duplicates, field blanks, laboratory blanks, laboratory duplicates, laboratory surrogate and matrix spikes, laboratory control samples, and calibration.

U.S. EPA Guidance for Quality 4-24 Assurance Project Plans (QA/G-5) (EPA 2002) can be found at: http://www.epa.gov/quality/qmps.html

12. Climate Change Emissions Minimization/Reductions:

The GLFC shall encourage;
(i) minimization and reduction, where possible, of greenhouse gas emissions resulting
(ii) from activities carried out pursuant to this agreement and
(iii) the tracking of the reduction of greenhouse gas emissions through these activities.

13. Contract Termination, Disputes and Protests

If a contract or order awarded pursuant to this IA is terminated or cancelled or a dispute or protest arises from specifications, solicitation, award, performance or termination of a contract, the Commission will take appropriate action in accordance with the terms of the contract and applicable laws and regulations. The U.S. EPA shall be responsible for all costs associated with termination, disputes, and protests, including settlement costs, except that the U.S. EPA shall not be responsible to the Commission for costs associated with actions that stem from errors in performing the responsibilities assigned to the GLFC. The GLFC shall consult with the U.S. EPA before agreeing to a settlement or payments to ensure that the GLFC has adequate time in which to raise or address any fiscal or budgetary concerns arising from the proposed payment or settlement.

14. Termination

This IA may be terminated upon thirty (30) calendar days written notice by either party. If this agreement is cancelled, any implementing contract/order may also be cancelled. If the IA is terminated, the agencies shall specify the terms of the termination, including costs attributable to each party and the disposition of awarded and pending actions.

15. Interpretation of IA

If the GLFC and U.S. EPA are unable to agree on the interpretation of a material aspect of this IA, the parties agree to engage in an effort to reach mutual agreement regarding the proper interpretation of this IA, including amendment of this IA, as necessary, by escalating the dispute within their respective organizations.

If a dispute related to funding remains unresolved for more than sixty (60) calendar days after the parties have engaged in an escalation of the dispute, the parties agree to refer the matter to their respective Agency Chief Financial Officers with a recommendation that the parties submit the dispute to the CFO Council Intragovernmental Dispute Resolution Committee for review in accordance with Section VII of

Attachment 1 to the Treasury Financial Manual, Volume 1, Bulletin No. 2007-03, Intragovernmental Transactions, Subject: Intragovernmental Business Rules, or subsequent guidance.

16. Indirect Costs

The GLFC certifies that (1) any indirect costs incurred by the GLFC included in billings to U.S. EPA represent, in accordance with generally accepted accounting principles, indirect costs that would not have been otherwise incurred by the performing agency, or (2) statutory authority exists for charging other than the incremental costs of performance. If an audit determines that any direct or indirect costs charged to U.S. EPA are unallowable, U.S. EPA will be notified immediately following the resolution of the audit and U.S. EPA will be credited those amounts.

17. Payment

Not more than 30 days before incurring reasonable and necessary costs described in the scope of work, the GLFC may, pursuant to this Agreement, submit an estimated payment request via the IPAC system for the electronic transfer of funds to pay such costs. When an IPAC charge is reflected against the CFC's Agency Location Code (ALC) 68-01-0727, the Treasury Department will automatically transfer funds to the requesting Agencies ALC. The GLFC will use its best efforts to obligate/expend any funds it receives within 30 days of receipt. On a monthly basis, a breakdown of the costs associated with payments must be provided to the U.S. EPA Project Officer (U.S. EPA PO). This information allows the U.S. EPA PO to determine that costs billed to U.S. EPA are necessary and reasonable. If this information is not provided, the U.S. EPA PO will notify the OCFO/CFC to suspend or charge back the payment. For further information, please contact:

U.S. EPA CFC
Attn: Jeff Marsala
26 W. ML King Dr.
Cincinnati, OH 45268·7002

18. IAs with Contracts or Procurement

In accordance with Public Law (P.L) 102·389, U.S. EPA's policy requires, to the fullest extent possible, that at least 8% of its overall Federal funding for prime and subcontractors awarded in support of authorized programs be awarded to business concerns or other organizations owned or controlled by socially and economically disadvantaged individuals, including historically black colleges and universities and women.
The GLFC agrees, in awarding contracts under this lA, to comply with U.S. EPA's aforementioned utilization policy for Minority Business Enterprises (MBEs) and Women's Business Enterprises (WBEs), which is codified at 40 C.F.R. Part 33. Where the subject IA is for the benefit of Native Americans, the GLFC agrees to comply with the provisions found at 40 C.F.R. Section 33.304(c), which provides for the preference for Indian-owned economic enterprises and Indian organizations in contracting. The GLFC will also strive to meet U.S. EPA's SBA negotiated goals for awarding contracts to small and disadvantaged businesses.

The GLFC will accomplish these objectives through adherence to the small and minority-owned business requirements set forth In the Small Business Act, 15 U.S.C. §§ 631 et seq., and the annual Small Business goals negotiated with the IA recipient and Small Business Administration. All reporting on MBE/WBE and small business accomplishments will be accomplished through the existing federal contracting reporting mechanism, currently the Federal Procurement Data System, Next Generation.

The report should be submitted to:

Office of Small Business Programs
U.S. Environmental Protection Agency
1200 Pennsylvania Ave., NW (Mall code: 1230T)

Washington, D.C. 20460

A copy should be sent to:

Greg Luchey, DBE Coordinator
U.S. EPA Region 10
1200 Sixth Avenue, Suite 900
Mail Stop: OMP-145
Seattle, WA 98101

19. Equipment Disposition: Title to Other Agency

Property/equipment authorized under this IA will be titled with the GLFC and subject to the GLFC's property management procedures with no further accountability to U.S. EPA.

20. International travel

International travel by GLFC in support of this IA is allowed for the personnel who are traveling outside of the United States up to a total travel budget of $50,000 for all trips.

21. As appropriate, disputes related to this agreement are to be resolved in accordance with instructions provided in the Treasury Financial Manual (TFM) Vol. 1, Intragovernmental Business Rules Bulletin, available on the TFM website at: http://www.fms.treas.gov/tfm/vol1/bull.html

22. Cost Collection Upon Cancellation

If the U.S. EPA cancels the order, the GLFC is authorized to collect costs incurred prior to cancellation of the order plus termination costs, up to the total payment amount provided for under the agreement.

Great Lakes Restoration Initiative
Interagency Agreement
Scope of Work
FY 2013

AGENCY NAME:

Department of State – Great Lakes Fishery Commission

CONTACT INFORMATION:

Mr. Stephen Domeracki, Business Manager
2100 Commonwealth Blvd., Suite 100
Ann Arbor, Michigan 48105
Phone: (734)-669-3017
Fax: (734)-741-2010
Email: sdomeracki@glfc.org

1. INTRODUCTION

Recognizing that the Great Lakes ecosystem is an invaluable resource containing more than 20% of the world's surface freshwater and providing drinking water to more than 40 million people, the Administration, in 2009, announced the Great Lakes Restoration Initiative (GLRI) to protect, restore and maintain the Great Lakes ecosystem. In conjunction with 15 other Federal Agencies, the United States Environmental Protection Agency (EPA) will implement strategic, priority actions to achieve the vision of a restored, protected, and sustainable Great Lakes ecosystem.

The purpose of this Interagency Agreement (IA) is to provide funding to the Great Lakes Fishery Commission (commission) through the EPA to help implement the priorities of the GLRI. Specifically, this IA applies to the Great Lakes Restoration Initiative Action Plan (Action Plan) and implements priority programs, projects, and activities to protect, restore, and maintain the Great Lakes ecosystem. This IA will allow the commission to implement priorities, programs, and projects of the Great Lakes Water Quality Agreement, such as the Lake-wide Management Plans, the Remedial Action Plans for Areas of Concern, the Bi-national Toxics Strategy, and the Cooperative Science and Monitoring Initiatives, among others.

Specifically, three priority projects will be implemented under this IA Scope of Work FY2013 as described below in the narratives. These projects include: Enhancing sea lamprey control by exploiting sea lamprey chemosensory communication; Restoring and managing native fish species through use of an acoustic telemetry observing system; and Grants for Great Lakes restoration of native fish species. Information about the history of each project, past accomplishments, detailed summaries of the work to be completed, and how the work will address the measures indentified in the Action Plan, and long-term and short-term goals are described in the narratives for the scope of work. A brief summary of each project is provided below.

Enhancing sea lamprey control by exploiting sea lamprey chemosensory communication: Effective sea lamprey control is a prerequisite to the rehabilitation of the Great Lakes ecosystem. The commission has developed techniques to exploit sea lamprey chemosensory communication (both pheromone attractants and alarm cue repellents) to enhance the current sea lamprey control program. Fiscal 2013 funds will help move chemosensory-based control tactics from the research and development stage to implementation in the sea lamprey control program and will increase the capture of adult sea lampreys and the efficacy of lampricide treatments. This project will collaboratively engage scientists in universities, the U.S. Fish and Wildlife Service, and the U.S. Geological Survey. This project falls under focus area 2: Invasive Species of the Action Plan and addresses Goal 5, Objectives 2 and 5, and Measures of Progress 2.

Restoration and management of native fish species through use of an acoustic telemetry observing system: The acoustic telemetry observing system will provide movement data, population estimates, and mortality rates to advance sea lamprey control, and to provide information to state and tribal natural resources agencies to help them choose fishery management actions to promote native fish restoration and to protect native species through fishery regulation. Movement of sea lamprey, lake trout, lake sturgeon, and walleye will be described in association with refuges, high intensity fishing areas, and through the Huron-Erie Corridor between Lake Huron and Lake Erie. This information is essential for sea lamprey control and fishery management decisions about Great Lakes rehabilitation. The system is designed to provide both 2- and 3-dimensional positioning to identify critical habitats, to estimate changes in population numbers, and estimate natural and fishing mortality rates, specifically to aid the implementation of invasive species controls and fishery restoration. This project will collaboratively engage fish managers from state and tribal natural resources agencies. This project falls under focus area 2: Invasive Species of the Action Plan and addresses Goal 5, Objectives 2 and 5, and Measures of Progress 2.

Grants for Great Lakes restoration of native fish species: This project is a competitive funding program to support studies, and the planning and implementation of restoration programs to aid in recovery of native fish species. Fish that have become extirpated from portions of the Great Lakes include lake trout, several species of ciscoes, deepwater sculpins, and lake sturgeon, each important to Great Lakes food webs. The project will be implemented via a special call for proposals and will be administered via the competitive proposal process administered by the commission. This project falls under focus area 4: Habitat and Wildlife Protection and Restoration of the Action Plan and addresses Goals 1-4, Objectives 2 and 3, and Measures of Progress 3 and 5.

2. BUDGET & PROJECT DETAIL

Focus Area	Project Title	Draft Allocation
2	Enhancing sea lamprey control by exploiting sea lamprey chemosensory communication	$1,727,070
2	The use of an acoustic telemetry observing system for species restoration and management	$806,663
4	Grants for Great Lakes restoration of native fish species	$475,000

3. NARRATIVE SCOPE OF WORK:

Project Title: Enhancing sea lamprey control by exploiting sea lamprey chemosensory communication

Funding Amount: $1,727,070

Authority for Work: Great Lakes Fisheries Act of 1956

Description of Work: This project builds upon the progress made during 2010-2012 by funding the continued development and application of sea lamprey migratory and mating pheromones (attractants) and alarm cues (repellents) to increase the capture of adult sea lampreys and the efficacy of lampricide treatment – thereby enhancing sea lamprey control. Additionally, this project will continue to fund projects investigating the impacts of attractants and repellents on non-target fish and lamprey species (important information needed prior to registration of attractants and repellents with the EPA and implementation in the sea lamprey control program), technical assistance for attractant and repellent development, and regulatory agency compliance assistance. Based on consultation with commission partners, projects continuing investigations of using attractants and repellents to enhance trapping operations and to redistribute adult (and subsequently larval) sea lamprey populations to increase the effectiveness and efficiency of lampricide treatments, and new projects investigating alternative uses for attractants (such as the development of agonists or antagonists to disrupt pheromone communication), the use of sea lamprey repellents to block sea lampreys from certain habitats, and the use of attractants and repellents together (push – pull methods) to guide sea lampreys into traps or into unsuitable habitats will be implemented. Techniques developed and information gained from this project will support the rehabilitation of the Great Lakes fish communities and ecosystem by reducing sea lamprey populations and their predation on fish.

Sea lampreys invaded the upper Great Lakes in the early 1900s and destroyed both the Great Lakes ecosystem and the economic viability of the fishing and tourism industries. The Great Lakes Fishery Commission was formed by treaty between the United States and Canada in 1955, and one of its mandates is to control the invasive sea lamprey. The commission is one of several "international fisheries commissions" under the U.S. Department of State.

Sea lamprey control has been successful. In most areas of the Great Lakes, sea lamprey populations have been reduced by 90%. Nevertheless, an on-going control program is essential, as sea lampreys are resilient such that populations will bounce back quickly in the absence of an effective control program. The primary control technique is the use of a unique lampricide (TFM) that targets lampreys. The commission uses other techniques including barriers and traps. The commission carries out the sea lamprey control program in cooperation with the U.S. Fish and Wildlife Service, Department of Fisheries and Oceans Canada, U.S. Geological Survey, and U.S. Army Corps of Engineers. Funding is provided by Congress through the U.S. Department of State.

The commission has aggressively pursued the goal of developing and implementing new sea lamprey control techniques exploiting chemosensory communication to diversify the control program and make it more effective. Chemosensory cues such as pheromones are natural compounds that animals emit to cause or catalyze important behaviors or physiological processes in conspecifics. Pheromones are commonly used by many species to facilitate sexual maturation and reproductive behaviors. The commission's research has identified two pheromones that affect sea lamprey behavior during spawning: a migratory pheromone and a mating pheromone. The migratory pheromone is released by larval sea lampreys living in stream beds and communicates to adult sea lampreys that the stream is suitable for spawning by virtue of housing larval sea lampreys. The mating pheromone is released by sexually mature male sea lampreys within a spawning stream and facilitates reproduction by promoting sexual maturation of conspecifics and attracting sexually mature female sea lampreys. Additionally, chemosensory cues are also used to communicate danger (called alarm cues) and cause avoidance responses in conspecifics when encountered. The sea lamprey has long been suspected of using alarm cues, and compounds released from dead sea lampreys have been shown to cause avoidance responses in conspecifics.

The commission and its partners believe that by understanding how sea lampreys communicate through chemosensory cues, their behaviors can be manipulated for control purposes. For example, by using pheromones sea lampreys have been lured into traps, and pheromones and alarm cues might be used to lure sea lampreys into streams not suitable for spawning, into streams that are easy and effective to treat with lampricides, or away from streams suitable for spawning that are hard to treat with lampricides. During the previous 30 years, the commission has invested millions of dollars in the development of chemosensory controls. Prior to the Great Lakes Restoration Initiative, the progress had been slow because the commission needed to balance the development of new techniques with the necessity to maintain the existing levels of sea lamprey control using established techniques (even short-term relaxation of sea lamprey control will wreak major harm on the Great Lakes ecosystem). Progress during 2010-2012 has brought pheromone-baited trapping to the brink of deployment on a basin-wide scale. Techniques developed and information gained through the 2013 projects will further develop pheromone-baited trapping and other chemosensory-based control techniques, lead to a more effective sea lamprey control program, reduce sea lamprey populations and sea lamprey predation on fish, and support rehabilitation of the Great Lakes fish communities and ecosystem.

Overall, the commission has identified many high priority projects above its base funding that would help continue to move the chemosensory program from the research and development stage into the implementation stage. The 2013 GLRI chemosensory-based control project will build on the 2010-2012 GLRI investment and progress, and will further enable the rapid development and implementation of sea lamprey control techniques using pheromones and alarm cues. During 2010-2012, funds were provided to continue development of the mating pheromone component 3kPZS for use in sea lamprey trapping. During 2013, information gained during 2010-2012 will be used in the final development of a trapping technique using 3kPZS and plans for deployment basin-wide will begin. Identification of other pheromone components, characterization of their function, development into control techniques, and implementation of these techniques into the sea lamprey control program will also continue (several novel components of the migratory and mating pheromone are set for laboratory and field behavioral testing). Additionally, projects on sea lamprey pheromone agonists and antagonists, alarm cues (as repellents), and attractants and repellents together (push-pull methods) will continue and move towards development into sea lamprey control techniques. Funds during 2013 will also be used to continue funding a competitive grant program to accelerate chemosensory research, continue projects investigating the impacts of chemosensory cues on non-target fish and lamprey species, purchase commercially synthesized pheromones, provide technical support to projects through the U.S. Fish and Wildlife Service, provide regulatory agency compliance assistance through the U.S. Geological Survey, expand chemosensory-based control tactic development capacity at the U.S. Geological Survey Hammond Bay Biological Station and Michigan State University, and provide project-specific equipment and supplies. Funds for 2013, if provided, would accelerate this priority program and ensure implementation without sacrificing the existing sea lamprey control program. Once completed, the implementation of techniques using chemosensory cues will enhance the overall sea lamprey control program.

This project will support the enhancement of the sea lamprey control program and restoration of native fish species in the Great Lakes. The long-term objectives for the use of sea lamprey chemosensory cues in sea lamprey control will be as follows:

1. Implement sea lamprey control strategies using chemosensory cues (attractants and repellents) coupled with existing sea lamprey control strategies (trapping, barriers, and lampricides) to control sea lampreys to target levels and allow for native fish restoration in each of the Great Lakes.

2. Use the mating pheromone component 3kPZS and the newly identified migratory pheromone component LW1 to bait barrier-integrated sea lamprey traps and significantly increase trapping efficiencies from the historical average of 40%.

3. Use 3kPZS and LW1 to develop free-standing sea lamprey traps (function without a barrier) that capture 70% of the adult sea lamprey population.

4. Use 3kPZS and LW1 to lure migrating adult sea lampreys into streams and habitats that are not suitable for spawning, larval-rearing, or that are easy and effective to treat with lampricides, and away from streams that are difficult to treat with other sea lamprey control methods.

5. Characterize the functions of the additional sea lamprey mating and migratory pheromone components that have been identified, and develop them for use in sea lamprey trapping operations and other behavioral manipulation strategies.

6. Identify and characterize additional components of the mating and migratory pheromones to enhance previously developed sea lamprey control techniques using pheromones and develop new techniques.

7. Identify or synthesize sea lamprey mating and migratory pheromone agonists and/or antagonists and develop them for use in the sea lamprey control program (both have the potential to disrupt pheromone communication).

8. Identify and characterize the components of sea lamprey alarm cues to enhance previously developed sea lamprey control techniques using the mating and migratory pheromone (push-pull methods) and develop new techniques using alarm cues alone (chemical barriers to block sea lampreys from suitable spawning habitats).

Key partners in this project will be the U.S. Geological Survey, the U.S. Fish and Wildlife Service, and Michigan State University. The project will also support research projects undertaken by universities and supported by the Great Lakes Fishery Commission. A key supplier of commercially synthesized pheromone components will be Bridge Organics Company of Vicksburg, Michigan.

Approximately $500,000 will be awarded to projects investigating sea lamprey attractants and repellents and their potential use in sea lamprey control. The awards will be made through the competitive process used by the Great Lakes Fishery Commission's Science Program http://www.glfc.org/research/ with quality management provided by an established peer review process and a scientific board review and recommendation.

The commission has a long history of fostering the restoration of Great Lakes fisheries. Key initiatives during its 50+ year history have been sea lamprey control and the restoration of native fish species. Some of the products of the Science Program may be viewed at http://www.glfc.org/pubs_out/communi.php. The Convention on Great Lakes Fisheries grants to the Great Lakes Fishery Commission jurisdiction for sea lamprey control in all five of the Great Lakes and their tributaries, in the eight states, and the province of Ontario. In addition, the convention charges the commission with the conduct, coordination, and communication of research essential to the restoration of the Great Lakes.

This project is consistent with the Great Lakes Regional Collaboration Restoration Strategy to Restore and Protect the Great Lakes http://glrc.us/. Within the Aquatic Invasive Species appendix, the strategy calls for full funding for the Great Lakes Fishery Commission's sea lamprey control program and states that "Pheromones have been isolated from sea lampreys and offer an exciting opportunity to augment current sea lamprey control efforts". Sea lampreys are the one invader that can be controlled and the control effort is the backbone of fishery restoration and economic benefits of the fishery. Thus, this request is critical to both invasive species control and native species restoration.

The information from this project will be used to develop and implement new sea lamprey control techniques using attractants and repellents, increase the effectiveness of the sea lamprey control program, and accelerate the recovery of native fish species such as lake trout.

This project also supports accomplishment of the Fish Community Objectives developed by the eight Great Lakes states, federal fishery agencies (e.g., the U.S. Fish and Wildlife Service, the U.S. Geological Service, Fisheries and Oceans Canada), the province of Ontario, and the tribes for each of the Great Lakes. Fish community objectives specify the desired fish communities, indicate how those objectives should be met, and outline how the success of the rehabilitation efforts will be measured. Each lake has specific management plans for the restoration of lake trout and in many cases lake sturgeon. The foundation of fish community objectives—including the restoration of native species—is sea lamprey control.

Milestones:

2013

January 1: Implementation of laboratory projects
January – February: Project design and identification of essential equipment and supplies
February – March: Purchase essential equipment and supplies
February – April: Purchase pheromone components
February – September: Contract work to support the registration of known pheromone components with regulatory agencies.
March 1: Implementation of field projects
April 1: Project documentation and reviews complete
August – December: Data processing and analyses

2014

January: Data processing and analyses, continued
February: Report writing
February: Progress and completion reports submitted

Great Lakes Action Plan Measures of Progress:

GLRI Action Plan Focus Area 2: Invasive Species

Goal 5: An effective, efficient, and environmentally sound program of integrated pest management for priority invasive species is developed and implemented, including program functions of containment, eradication, control, and mitigation.

Objective: Six technologies that prevent the introduction of invasive species and four technologies that either contain or control invasive species will be developed or refined and piloted by 2011. Ten technologies that prevent the introduction of invasive species and five technologies that either contain or control invasive species will be developed or refined and piloted by 2014.

Objective: By 2014, invasive species populations within the Great Lakes Ecosystem will have been controlled and reduced, as measured in populations controlled to a target level in 6,500 acres of managed area and by removing 5,000 pounds of invasive species from the Great Lakes ecosystem.

Measure of Progress: Acres managed or amount of species removed for populations of invasive species controlled to a target level (cumulative).

The Principal Actions for this project include:

Develop and Demonstrate Innovative Control Technology – Promote the development and use of new control technologies, including biological control methods, which will significantly reduce the cost and/or increase the effectiveness of invasive species control measures.

Control Key Invasive Species and Investigate Causal Mechanisms by which ANS Impact Native Species – Develop a better understanding and models of ecosystem interactions and management options for minimizing the impact of ANS, including new treatment or control methods.

The ultimate outcome desired is the control of sea lampreys by trapping upstream migrating adults, diverting migrating adult sea lampreys to streams with unsuitable spawning or larval-rearing habitat, or that are easy and effective to treat with lampricides, or by other means of disrupting chemosensory communication. The commission expects to implement by the beginning of FY2014 a basin-wide sea lamprey control program including at least one technique using sea lampreys pheromones, with several more chemosensory-based techniques in development. If successful with the development of attractants and repellents, the information will help to enhance sea lamprey control within 72 Great Lakes tributaries (over 200,000 surface acres). As of 2013, one mating pheromone component, 3kPZS, has been sufficiently characterized to test at the management scale. One component of the migratory pheromone, LW1, is on the verge of being ready for field testing during 2013. Additionally, several other compounds have been identified or are on the verge of being identified and characterized, and will soon be in development for use in the sea lamprey control program.

Specific Measurable Outputs: In 2013, plans for the use of 3kPZS as bait in trapping operations on Great Lakes tributaries will be finalized with full implementation to occur in 2014. On a small scale, trapping using 3kPZS will allow for the capture of at least 1,000 additional adult sea lampreys (a 21% increase). Removing these adults from the spawning population will result in an estimated reduction of 5,200 parasitic sea lampreys and save an estimated 208,000 lbs of fish from sea lamprey predation. Additionally, when 3kPZS is used in traps across the Great Lakes basin and the migratory pheromone component LW1 is used in sea lamprey trapping (the anticipated outcome of this work) an estimated 25,000 additional adult sea lampreys would be removed resulting in an estimated reduction of 125,000 parasitic sea lampreys and savings of an estimated 5,000,000 lbs of fish from destruction. Furthermore, other projects supported by this GLRI grant will characterize a sea lamprey alarm cue (a natural repellent) that can be used to further enhance trapping and redistribution of migrating adults, and make attractant and repellent delivery to streams and traps more cost effective. Overall, this important work will enable the rehabilitation of fish communities and the ecosystem as a whole across the Great Lakes basin, while supporting and building local economies.

Project Title: Restoration and management of native fish species through use of an acoustic telemetry observing system

Funding Amount: $806,663

Authority for Work: Great Lakes Fisheries Act of 1956

Description of Work: This project will build upon investments made during 2010-2012 by finishing previously planned, but unfunded, portions of the observing system adjacent to the Drummond Island Refuge and at Saginaw Bay, Lake Huron, the Huron-Erie Corridor, and western and central Lake Erie. This project also will support adding additional sea lamprey producing tributaries in Lake Huron to the observing system to provide the first ever estimates of survival and mortality of the parasitic life phase of the sea lamprey. New and continuing projects investigating sea lamprey, lake trout, lake sturgeon, walleye, and muskellunge will be implemented.

The sizes and depths of the Laurentian Great Lakes have historically made direct observations of offshore fish communities difficult or impossible. Current understanding of these offshore communities comes from probing lake waters with nets or sonar pulses, essentially like probing a black box. These methods provide only snapshots in time, with no information about (1) where the fish sampled today were in the past, or (2) where these fish will be in the future. The limited knowledge of species movements and interactions is primarily based on interpretations of seasonal or diel surveys and/or from tagging studies. Hence, behavior models (or movement rules) do not exist for species such as sea lamprey, lake trout, walleye, and lake sturgeon, yet these species are the focus of vital federal and state species restoration programs. This information is critical for understanding sea lamprey movements to enhance control measures such as trapping and the use of pheromones, and for understanding reproductive behaviors in response to the physical environment (e.g., spawning reefs) for native species, for establishment of refuges and promulgating fishery regulations, and identifying critical habitats for protection. In addition, this information from the system also provides vital demographic statistics, survival and mortality estimates, which permits assessment and evaluation of ongoing management actions. This information is critical to an effective adaptive management approach. Continuation and expansion of the acoustic telemetry observing system in Lake Huron and Lake Erie will continue to provide this vital information. This project will acquire and deploy state-of-the-art acoustic telemetry equipment and tags to provide information critical to on-the-ground management decisions related to sea lamprey control and fishery restoration.

The next leap in understanding the behavior and interactions of key offshore species in the Great Lakes will come from the use of acoustic telemetry technology — merging measures of depth and temperature with explicit measures of spatial location. Acoustic telemetry can be applied at small spatial scales to study behavior and at large spatial scales to study, for example, movement, spawning site fidelity, or prevention of by-catch in commercial fishing gear. These technologies now exist, are proven, and provide new levels of understanding of multi-species behavior, movement, and interactions. This knowledge will provide the information to better manage fish populations, including the invasive sea lamprey, to regulate harvests and by-catch, to establish boundaries for refuges, to evaluate new technologies such as artificial reefs in the Huron-Erie Corridor, and to better understand major ongoing changes in the fish community in Lake Huron, Lake Erie, and elsewhere in the Great Lakes.

This project will build on the previous GLRI investment and place additional acoustic hydrophones in key locations in Lake Huron, Lake Erie, and Huron-Erie Corridor. Geographic scope of this project so far includes: 1) Ocqueoc River, Lake Huron – sea lamprey, 2) St. Marys River between Lake Superior and Lake Huron – sea lamprey, 3) U.S. shoreline of Lake Huron – walleye, 4) Huron-Erie Corridor – walleye and lake sturgeon, and 5) Drummond Island Refuge, Lake Huron – lake trout. In 2013, this project will expand the acoustic telemetry observing system in Lake Huron and Lake Erie for sea lamprey and walleye. This expansion will be used to better understand the movement and mortality of parasitic sea lamprey prior to spawning in Lake Huron and to investigate migration patterns and mortality of walleye stocks in western and central Lake Erie. Funds in 2013 will also be used to purchase acoustic tags, data processing and management, and for labor and vessel time for installation, testing, and verification of arrays, personnel to perform these projects, and project specific costs.

This project will support restoration of Great Lakes native fish species over the next 20 years. The long-term objectives for the use of the acoustic telemetry observing system are as follows:

1. Describe the movement patterns of adult sea lampreys as they enter and move about the upper part of the St. Marys River (turning basin) to guide placement of additional traps, to evaluate the use of pheromones in conjunction with traps, and to identify specific areas used by spawning sea lampreys that can be a target for control actions.

2. Describe the migratory patterns of upstream-migrating adult sea lampreys in two medium-large and two small tributaries to Lake Huron along with the associated environmental and physical characteristics to develop movement rules to facilitate new trapping strategies to remove lamprey reproduction.

3. Describe the movements of pre-migratory adult sea lampreys in Lake Huron as they encounter river plumes with and without additions of synthetic migratory pheromone and to describe their behavior in the lower parts of the rivers that they choose to enter.

4. Describe the movements and survival rates of sea lamprey prior to spawning in Lake Huron. These data will be useful to the sea lamprey control program in understanding factors affecting sea lamprey spawning migration and developing efficient methods to estimate lake-wide parasitic sea lamprey abundance.

5. Describe at transects along the shoreline in northern Lake Huron the seasonal and diel spatial intersections of native walleye, lake whitefish (the primary commercial species), lake trout (the species of primary concern relative to bycatch), and lake sturgeon. These data will be used to develop whitefish management recommendations to minimize lake trout bycatch and promote lake trout restoration and to protect and conserve lake sturgeon.

6. Determine magnitude of movement of walleyes spawning in the Tittabawassee River between Saginaw Bay and the main basin of Lake Huron and the level of co-mingling with stocks in the Huron-Erie Corridor and western Lake Erie. These data will contribute to understanding the effects of Saginaw Bay walleye production on prey consumption and fisheries of the main basin of Lake Huron and guide management decisions for fisheries regarding the resurgence of native walleyes in Lake Huron and harvest management in Lake Erie.

7. Determine the proportions of different walleye stocks that migrate out of the western basin of Lake Erie and to compare mortality rates of these stocks. An improved knowledge of the migratory patterns and mortality rates of the walleye stocks in Lake Erie will facilitate the development of improved management strategies for one of the Great Lakes largest commercial and recreational fisheries.

8. Determine if lake sturgeon spawning in the Detroit and St. Clair rivers represent a metapopulation comprised of several local populations differentiated by distinct migration patterns and use of spawning rivers and sites. These data will help managers address conservation needs for populations of lake sturgeon in the Great Lakes.

Key partners in this project will be the U.S. Geological Survey, the Chippewa-Ottawa Resource Authority, the U.S. Fish and Wildlife Service, the Michigan Department of Natural Resources, Ohio Department of Natural Resources, Ontario Ministry of Natural Resources, Carleton University, and Michigan State University. The system will also support research projects undertaken by universities and supported by the Great Lakes Fishery Commission.

The commission has a long history of fostering the restoration of Great Lakes fisheries. Key initiatives during its 50+ year history have been sea lamprey control and the restoration of native fish species. Some of the products of the Science Program may be viewed at http://www.glfc.org/pubs_out/communi.php. The Convention on Great Lakes Fisheries grants to the Great Lakes Fishery Commission jurisdiction for sea lamprey control in all five of the Great Lakes and their tributaries, in the eight states, and the province of Ontario. In addition, the convention charges the commission with the conduct, coordination, and communication of research essential to the restoration of the Great Lakes.

This project is consistent with the Great Lakes Regional Collaboration Restoration Strategy to Restore and Protect the Great Lakes http://glrc.us/. Within the Habitat/Species Issue chapter, the strategy calls for funding initiatives focused on lake trout and sturgeon rehabilitation, including the development of techniques for assessment and understanding variables important for restoration (pages 24-25). In addition, the Aquatic Invasive Species chapter recommends increased control of sea lamprey, including development of appropriate barriers and implementation of a system of enhance monitoring (pages 19-21). The acoustic telemetry observing system is also consistent with the Indicators and Information chapter calling for a "network of observing systems" (page 55). Thus, this request is supportive and consistent with this major initiative to coordinate future restoration needs. The project proposed is critical to both to invasive species control and native species restoration.

The information from this project will be used to accelerate the recovery of native species such as lake trout and lake sturgeon. Also, understanding specific patterns of lamprey movements in lake and stream environments will assist in the use of pheromones for trapping and control of the invasive sea lamprey.

This project will also support accomplishment of the Fish Community Objectives developed by the eight Great Lakes states, federal fishery agencies (e.g., the U.S. Fish and Wildlife Service, the U.S. Geological Service, Fisheries and Oceans Canada), the province of Ontario, and the tribes for each of the Great Lakes. Fish community objectives specify the desired fish communities, indicate how those objectives should be met, and outline how the success of the rehabilitation efforts will be measured. Each lake has specific management plans for the restoration of lake trout and in many cases lake sturgeon. The foundation of fish community objectives—including the restoration of native species—is sea lamprey control.

Milestones:

2013

January – February: Project design
February – March: Purchase acoustic tags, receivers, and associated equipment and facilities
April 1: Project documentation and reviews complete
April – July: Final design of receiver placement
April – September: Receiver placement in systems and testing
April – October: Capture, tag placement, and release of fish
May – June: Tag/receiver sensitivity testing
June – July: Bathymetry and substrate evaluation
July – December: Recovery of receivers
August – December: Download receiver data
September – December: Data processing and analyses

2014

January: Data processing and analyses, continued
February: Report writing
February: Progress and completion reports submitted

Great Lakes Action Plan Measures of Progress:

GLRI Action Plan Focus Area 2: Invasive Species

Goal 5: An effective, efficient, and environmentally sound program of integrated pest management for priority Invasive Species is developed and implemented, including program functions of containment, eradication, control, and mitigation.

Objective 2: Six technologies that prevent the introduction of invasive species and four technologies that either contain or control invasive species will be developed or refined and piloted by 2011. Ten technologies that prevent the introduction of invasive species and five technologies that either contain or control invasive species will be developed or refined and piloted by 2014.

Objective 5: By 2014, invasive species populations within the Great Lakes Ecosystem will have been controlled and reduced, as measured in populations controlled to a target level in 6,500 acres of managed area and by removing 5,000 pounds of invasive species from the Great Lakes ecosystem.

Measure of Progress 2: Acres managed or amount of species removed for populations of invasive species controlled to a target level (cumulative).

The Principal Actions for this project include:

Develop and Demonstrate Innovative Control Technology – Promote the development and use of new control technologies, including biological control methods, which will significantly reduce the cost and/or increase the effectiveness of invasive species control measures.

Control Key Invasive Species and Investigate Causal Mechanisms by which ANS impact Native Species – Develop a better understanding and models of ecosystem interactions and management options for minimizing the impact of ANS, including new treatment or control methods.

The ultimate outcome desired is the control of sea lampreys by trapping upstream migrating adults and control of harvest to protect lake trout, walleye, lake whitefish, lake sturgeon, and muskellunge to promote restoration. It is expected that during FY 2013 key trapping locations to test in the St. Marys River will be identified, determined whether a problem appears in the spawning behavior of hatchery lake trout when compared to wild lake trout, and whether Lake Huron and Lake Erie populations of walleye mix during the fishing season. If successful on the St. Marys River, the information will help to control sea lamprey within 180,880 surface acres of river. As of August 2010, one potential invasive species control site, the downbound West Neebish Island channel, has been identified as a likely candidate to catch spawning condition lamprey through interception trapping in the St. Marys River.

Specific Measurable Outputs:

Sea lamprey – In 2013, approximately 120 acoustic receivers will be placed in 63 Lake Huron streams and connecting channels to provide insight into movement and mortality of parasitic sea lamprey prior to spawning. Four hundred parasitic sea lamprey will be implanted with acoustic transmitters and released throughout Lake Huron and northern Lake Michigan. The information obtained will be useful to the sea lamprey control program in understanding factors affecting sea

lamprey spawning migration and developing efficient methods to estimate lake-wide parasitic abundance.

Walleye – In 2013, approximately 150 acoustic receivers will be deployed throughout the Huron-Erie Corridor, western Lake Erie, Lake Huron, and Saginaw Bay to track to the migration of walleye between these systems and better understand movements related to spring spawning migration and better understand natural mortality of this economically important native species. Four hundred walleye were implanted with acoustic transmitters during 2010-2011. No new tags will be purchased under the current funding scenario, only continued monitoring of tagged fish surviving into 2013. The placement of these receivers throughout the Huron-Erie Corridor provides added benefit by allowing additional tracking studies for other native species such as lake sturgeon, a currently threatened native species, and whitefish an important native species for the commercial fishing industry in the region.

Walleye – In 2013, a double curtain of approximately 115 acoustic receivers will be deployed across the western basin of Lake Erie to investigate migration patterns and mortality of walleye. Two hundred walleye will be implanted with acoustic transmitters, in addition to the 400 walleye tagged during 2010-2011 as part of the existing study. This study will provide added coverage to the existing walleye study currently underway, and help guide management of one of the largest commercial and recreational fisheries in the Great Lakes.

Lake trout – In 2013, acoustic receivers will be deployed around the Drummond Island Refuge, Lake Huron. During 2010-2012, descriptions of hatchery and wild lake trout movements were recorded showing how lake trout use deepwater ridges to guide the directional movement to find spawning shoals, six spawning locations were located, and high-resolution video of spawning lake trout was captured for the first time ever. Behavioral differences will be analyzed between hatchery and wild lake trout to identify traits that can be used for successful restoration of this native species. The information obtained can be immediately used in the development of effective spawning refuges or aquatic protected areas and to identify key areas to stock fish to promote restoration of this important species.

Project Title: Grants for Great Lakes restoration of native fish species

Funding Amount: $475,000

Authority for Work: Great Lakes Fisheries Act of 1956

Description of Work: Entire communities of deep-water fishes were eliminated from nearly all five Laurentian Great Lakes by the mid 20th century. With few exceptions, deep-water fishes have remained absent from large volumes of Great Lakes deep-water habitats to the present day. At some locations, the same problem exists for the shallow-water fish communities. The Great Lakes Fishery Commission, a bi-national agency coordinating the management and research of Great Lakes fisheries, has stressed the importance of conserving biological diversity represented in the form of species, populations, and communities. Deep-water fish communities comprised of lake trout, burbot, ciscoes and whitefish, and sculpins, were once major components of this diversity as well as shallow-water species such as lake cisco and brook trout. Present conditions offer promise for future re-establishment of native fishes. For example, potential source populations exist in Lake Superior, for species such as lake trout and ciscoes, and elsewhere that could be used for reintroduction into lakes where native species are extirpated. Many of the variables contributing to the initial decline (i.e., fishery overharvest, non-native alewife) are now managed cooperatively by state, federal, and tribal agencies. Furthermore, rainbow smelt and alewife,

non-native species, are presently lower in abundance now than when they were thought to contribute through predation, competition, and disease to the decline of native species. The timing has never been better during the past 50 years to accelerate efforts to restore native species to the Great Lakes.

Restoration projects funded will investigate and promote suitable environmental conditions for native species, and include the physical reintroduction of native species and assessment of those reintroductions. Restoration will be successful when a native species persists long-term via the establishment of self-sustaining populations through natural reproduction. The term "restoration" as used here does not require that previous or historic environmental conditions are restored, but acknowledges that Great Lakes communities have been irreversibly altered (such as by invasive species) and that native fish recovery must proceed within this context.

Deep-water communities occur in waters below approximately 60 feet and the thermocline. These habitats are characterized by high hydrostatic pressures, nearly constant cold temperatures, and minimal ambient light. Native deep-water fishes include lake trout, several species of pelagic ciscoes, and sculpins. Where these species have been extirpated, the habitats have remained virtually devoid of species native or non-native. Restoring these areas, currently void of fish species, should greatly enhance the fish production from the lakes and promote stability, resistance to change, and resilience to recovery from perturbations such as new non-native species.

Shallow-water species originally occurred in the near-shore waters and these habitats represent the most perturbed waters of the Great Lakes. The formerly massive commercial fisheries for lake cisco of the early twentieth century are now absent from four of the five Great Lakes. Near-shore sport fisheries for brook trout, world renowned in the early 1900s, are gone as well. Restoration of these shallow water species could revitalize near-shore fisheries.

This project will address key management questions related to successful re-establishment of native deep- and shallow-water fish communities in the Laurentian Great Lakes. In addition, the project will provide funds to plan and implement programs to re-introduce native species to the Great Lakes. The intent of this project is to improve biological understanding of native fish communities and to provide management agencies with new techniques and understanding essential for species re-establishment. It is recognized that successful re-establishment of deep-water fishes will ultimately rely on both biological understanding and social, political, and economic capital. Management decisions reflect the interplay between biological understanding and cultural values, which differs among species and lakes. Within this broader management context, this project will focus on biological issues related to the re-establishment of native fishes. This conceptual approach goes beyond a population-level focus and intends to challenge managers and researchers to consider lake trout, pelagic ciscoes, and sculpins within a context of metapopulation, community, and ecosystem-level processes. In so doing, the aim of this project is to prompt research efforts at many levels of organization (i.e., life history, population, community, and ecosystem) and to incorporate these considerations into management through planning and implementation of restoration programs.

The priorities for the research portion of the project will be guided by the concepts described within a peer reviewed paper describing the commission's native fish restoration research theme (Zimmerman, M. S., and C. C. Krueger, 2009. An ecosystem perspective on re-establishing native deep-water fishes in the Laurentian Great Lakes. North American Journal of Fisheries Management 29:1352-1371). The research theme identifies key areas of scientific information needed to re-establish native fish communities in the Laurentian Great Lakes by (1) developing a conceptual model for native deep-water fish communities, (2) reviewing current research on lake trout, pelagic ciscoes, and sculpins in relation to the conceptual model, and identifying important research questions for each taxon, (3) posing questions emergent at community and ecosystem levels, and (4) identifying high priority research topics.

The planning and implementation phase will be guided and conducted collaboratively with federal, state, and tribal natural resources agencies through the Joint Strategic Plan (http://www.glfc.org/fishmgmt/jsp97.pdf) and facilitated by the commission via the Lake Committees (http://www.glfc.org/lakecom/). In some cases, such as for lake trout, inter-agency management plans already exist for species restoration (e.g., Lake Huron http://www.glfc.org/pubs/SpecialPubs/LkTroutRepHuron.pdf) but have been only partially implemented. For other species such as lake cisco, deep water cisoes, and sculpins, no management plans exist for any lake. This project will address these needs both to establish inter-agency plans for species restoration as well as to provide support for their implementation.

Objectives for this project will be as follows:

1. To communicate a call for proposals to the Great Lakes management and research community to fund native species restoration proposals.

2. To review proposals through the commission's science advisors and lake committees to develop joint recommendations for project funding.

3. To administer funding to successful project applicants.

4. To ensure that projects are completed as described, including completion reports.

Key partners in this project will be the eight Great Lakes states, tribal authorities, U.S. Geological Survey, the U.S. Fish and Wildlife Service, and universities in the Great Lakes basin. The awards will be made through the well-established competitive process used by the Great Lakes Fishery Commission's Science Program http://www.glfc.org/research/. Project administration will be performed by commission staff.

The commission has a long history of fostering the restoration of Great Lakes fisheries. Key initiatives during its 50+ year history have been sea lamprey control and the restoration of native fish species. Science program products may be viewed at http://www.glfc.org/pubs_out/bibliography.php.

The Convention on Great Lakes Fisheries charges the Great Lakes Fishery Commission to advise governments about measures required for sustainable fisheries, to promote coordinated and collaborative fishery management, and to conduct, coordinate, and communicate research. In addition the convention grants to the commission jurisdiction for sea lamprey control in all five of the Great Lakes and their tributaries, in the eight states and the province of Ontario.

The estimated number of proposals to be funded (sub-awards) will be approximately five projects annually (~$100,000 per project) through a competitive process.

Strategic Great Lakes Planning Linkages: The Great Lakes Regional Collaboration Restoration Strategy to Restore and Protect the Great Lakes http://glrc.us/, the Habitat/Species Issue chapter, calls for funding initiatives in its long term goals focused on restoring "reproducing native fish species, especially lake herring, deepwater ciscos, lake trout, yellow perch, walleye, lake whitefish, coaster brook trout, lake sturgeon, American eel, and Atlantic salmon" and specifically recognizes that self-sustaining populations "contribute to the stabilize of fish communities" (page 24). Specific actions recommended include funding projects focused on improving "assessment and exploitation strategies and management protocols" for important native species and to support projects that help to "develop an understanding of factors involved in recruitment of lake trout and other important native species, and remove or mitigate

major impediments to recruitment" (pages 25). Thus, this request is consistent and supportive of the Great Lakes Regional Collaboration.

The Grants for Great Lakes restoration of native fish species project proposed here directly supports the Healthy Great Lakes Ecosystems and Sustainable Fisheries pillar the Strategic Vision of the Great Lakes Fishery Commission 2011-2020 http://www.glfc.org/pubs/SpecialPubs/StrategicVision2012.pdf. The information from this project will be used to accelerate the recovery of native species such as lake trout, lake sturgeon, and other species in the Great Lakes basin.

The eight Great Lakes states, federal fishery agencies (e.g., the U.S. Fish and Wildlife Service, the U.S. Geological Service, Fisheries and Oceans Canada), the province of Ontario, and the tribes together developed Fish Community Objectives for each of the Great Lakes. Fish community objectives specify the desired fish communities, indicate how those objectives should be met, and outline how the success of the rehabilitation efforts will be measured. Each lake has specific management plans for the restoration of lake trout and in many cases lake sturgeon, and are in the process of developing plans for other species. The restoration of native species is a central component of these fish community objectives for the management agencies within the eight Great Lakes States. This project will directly support these efforts.

Milestones:

2013
January – February: Project proposals received from project leaders
February – March: Review of proposals by the Board of Technical Experts
April 1: Project leaders notified about full proposal preparation
June: Full proposals received
July – August: Peer review of proposals
September: Board of Technical Experts formulates final recommendations
December: Commission approves projects and contracts established

2014
February: Final report for the program completed

Great Lakes Action Plan Measures of Progress:

GLRI Action Plan Focus Area 4: Habitat and Wildlife Protection and Restoration

Goal 1: Protection and restoration of Great Lakes aquatic and terrestrial habitats, including physical, chemical, and biological processes and ecosystem functions, maintain or improve the conditions of native fish and wildlife.

Goal 2: Critical management activities (such as stocking native fish and other aquatic species, restoring access of migratory fish species at fish passage barriers, and identifying and addressing diseases) protect and conserve important fish and wildlife populations.

Goal 3: Sound decision making is facilitated by accessible, site specific and landscape-scale baseline status and trend information about fish and wildlife resources and their habitats.

Goal 4: High priority actions identified in strategic plans (such as state and federal species management, restoration and recovery plans, Lakewide Management Plans, Remedial Action Plans, and others) are implemented, lead to the achievement of plan goals, and reduce the loss of fish and wildlife and their habitats.

Objective 2: By 2014, 82% of recovery actions for federally listed priority species will be implemented.

Objective 3: By 2014, 53 percent of populations of native aquatic non-threatened and endangered species are self sustaining.

Measure of Progress 3: Number of species delisted due to recovery.

Measure of Progress 5: % of populations of native aquatic non-threatened and endangered species self-sustaining in the wild.

The Principal Actions for this project include:

Maintain, Improve or Enhance the Populations of Native Species - Implement restoration actions identified in species recovery and management plans; quantify habitat needs for depleted migratory bird species; propagate lake trout, coaster brook trout, lake sturgeon and other similar fingerlings for suppressed fish populations, assessing fish populations; and protect and restore culturally significant species.

Specific Measurable Outputs:

The eight Great Lakes states, federal fishery agencies (e.g., the U.S. Fish and Wildlife Service, the U.S. Geological Service, Fisheries and Oceans Canada), the province of Ontario, and the tribes together developed Fish Community Objectives for each of the Great Lakes. This project will directly support these collective fishery restoration efforts. Specifically, measurable outcomes include (1) identifying behavioral and communication mechanisms critical to lake trout spawning, and to use this information to change stocking strategies, develop restoration management plans, and implement habitat restoration to achieve self-sustaining populations of this native species, which is currently sustained through stocking; (2) understand the ecology of important native fish species (e.g., lake trout, ciscoes, lake sturgeon, deep-water sculpin, and/or Atlantic salmon) to inform and advance restoration efforts; (3) investigate propagation and stocking techniques of native species to increase stocking success; (4) assess the success of previous re-establishment efforts of native fish and identify barriers to future re-establishment success.

4. COLLABORATIVE ARRANGEMENTS

Formal agreements and procedures that will or have been put into place by the commission to collaborate with other entities are specifically described in the narratives for the scope of work for each project. Briefly, under the Great Lakes Fisheries Act of 1956 the commission was formed to develop and implement a sea lamprey control program and to coordinate fisheries research and management among Provincial, State, and Tribal entities. The commission's mandate for sea lamprey control is carried out in collaboration with the U.S. Fish and Wildlife Service, Department of Fisheries and Oceans Canada, and the U.S. Geological Survey through annual Memorandum of Agreements with each agency. The commission's mandate for coordinating fisheries research is carried out in collaboration with the U.S. Geological Survey, Michigan State University, and the University of Guelph through annual Memorandum of Agreements. Additionally, fisheries and sea lamprey research collaborations are established with universities and other research institutions through the commission's two peer-reviewed grants programs: the Fishery Research Program and Sea Lamprey Research Program. The commission's mandate for coordinating fisheries management is carried out in collaboration with federal, provincial, state, and tribal management agencies through the Joint Strategic Plan

((http://www.glfc.org/fishmgmt/jsp97.pdf) and facilitated by the commission via the Lake Committees (http://www.glfc.org/lakecom/).

5. FUNDING SUMMARY SPREADSHEET

See attached spreadsheet.

Great Lakes Restoration Initiative
Project Funding Summary Spreadsheet
FY 13
($3,008,733)

7/29/2013

Department of State - Great Lakes Fishery Commission

GREY AREAS WILL AUTOMATICALLY CALCULATE TOTALS

Focus Area 1. Toxic Substances and Areas of Concern

	Template Number	Template Name	Personnel	Fringe Benefits	Travel	Equipment	Other	Grants	Contracts	Procurement/ Assistance[3]	Sub-Total	Indirect Cost	Total	Indirect Cost Rates
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
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										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
		Sub-total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**#DIV/0!**

Focus Area 2. Invasive Species

	Template Number	Template Name	Personnel	Fringe Benefits	Travel	Equipment	Other	Grants	Contracts	Procurement/ Assistance[3]	Sub-Total	Indirect Cost	Total	Indirect Cost Rates
	1	Enhancing sea lamprey control by exploiting sea lamprey chemosensory communication	$11,667	$2,917	$0	$600,000	$0	$0	$1,030,277	$1,030,277	$1,644,861	$82,209	$1,727,070	4.76%
	2	The use of an acoustic telemetry observing system for species restoration and management	$11,667	$2,917	$5,000	$390,000	$0	$0	$358,667	$358,667	$768,251	$38,412	$806,663	4.76%
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
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										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
		Sub-total	**$23,334**	**$5,834**	**$5,000**	**$990,000**	**$0**	**$0**	**$1,388,944**	**$1,388,944**	**$2,413,112**	**$120,621**	**$2,533,733**	**#DIV/0!**

Focus Area 3. Nearshore Health and Nonpoint Source Pollution

	Template Number	Template Name	Personnel	Fringe Benefits	Travel	Equipment	Other	Grants	Contracts	Procurement/ Assistance[3]	Sub-Total	Indirect Cost	Total	Indirect Cost Rates
										$0	$0		$0	#DIV/0!
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										$0	$0		$0	#DIV/0!
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										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
		Sub-total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**#DIV/0!**

Great Lakes Restoration Initiative
Project Funding Summary Spreadsheet
FY 13
($3,008,733)

7/29/2013

Focus Area 4. Habitat and Wildlife Protection

	Template Number	Template Name	Personnel	Fringe Benefits	Travel	Equipment	Other	Grants	Contracts	Procurement/ Assistance[3]	Sub-Total	Indirect Cost	Total	Indirect Cost Rates
	3	Grants for Great Lakes restoration of native fish species	$11,667	$2,917	$0	$0	$0	$437,797	$0	$437,797	$452,381	$22,619	$475,000	4.76%
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										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
		Sub-total	**$11,667**	**$2,917**	**$0**	**$0**	**$0**	**$437,797**	**$0**	**$437,797**	**$452,381**	**$22,619**	**$475,000**	**#DIV/0!**

Focus Area 5. Accountability, Education, Monitoring, Evaluation, Communication and Partnership

	Template Number	Template Name	Personnel	Fringe Benefits	Travel	Equipment	Other	Grants	Contracts	Procurement/ Assistance[3]	Sub-Total	Indirect Cost	Total	Indirect Cost Rates
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
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										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
										$0	$0		$0	#DIV/0!
		Sub-total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**#DIV/0!**
		AWARD TOTAL	**$35,001**	**$8,751**	**$5,000**	**$990,000**	**$0**	**$437,797**	**$1,388,944**	**$1,826,741**	**$2,865,493**	**$143,240**	**$3,008,733**	